Government of Saskatchewan

Annual Report 1987-88

Saskatchewan Energy and Mines

for the fiscal year ending March 31, 1988

89-03890/

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Letters of Transmittal

The Honourable Frederick William Johnson
Lieutenant-Governor
Province of Saskatchewan

Dear Sir:

I have the honour to submit herewith the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1988.

Respectfully Submitted,

Honourable Patricia A. Smith
Minister of Energy and Mines

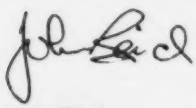
Letters of Transmittal

The Honourable Patricia A. Smith
Minister of Energy and Mines
Province of Saskatchewan

Dear Minister:

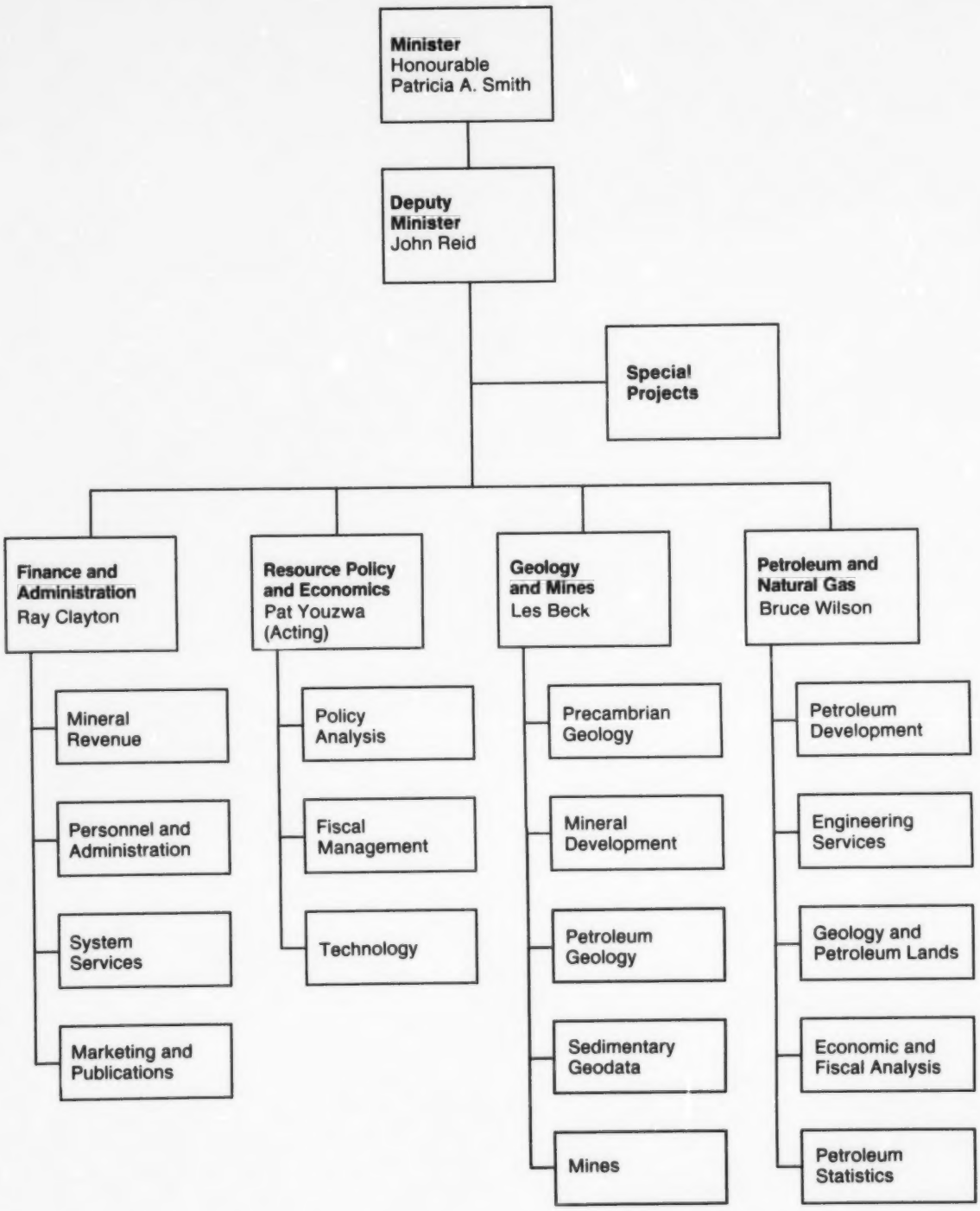
I have the honour to submit for your consideration, the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1988.

Respectfully Submitted,



John Reid
Deputy Minister
Saskatchewan Energy and Mines

Organization Chart



Finance and Administration Division

Ray Clayton
Assistant Deputy Minister

The Finance and Administration Division is responsible for mineral revenue collection and audits, internal administration and personnel, legislative co-ordination, mineral rights, system services, marketing and publications.

The Finance and Administration Division is composed of four branches:

- Mineral Revenue
- Personnel and Administration
- System Services
- Marketing and Publications

Mineral Revenue Branch

The Mineral Revenue Branch is responsible for collecting, recording and accounting for the various resource revenues owing to the province and for maintaining mineral land ownership records. The branch:

- ensures that revenues and accompanying returns and reports are received when due;
- assesses certain kinds of resource revenues on an annual or periodic basis;
- assesses interest and/or penalties on late payments and overdue returns;
- processes revenues through computer and manual systems, as input to financial and management information reports;
- audits resource companies to ensure compliance with taxation legislation;
- maintains historical records of all resource revenues received by the department;
- prepares and registers all mineral land transfers to the Crown through forfeiture and voluntary transfer;
- interprets and verifies mineral land ownership for various branches of the department and for industry;
- maintains a mineral land record of all Crown and freehold mineral ownership, which includes an up-to-date record of all Crown mineral land dispositions in the surveyed area of the province;
- verifies Crown mineral lands available for Crown mineral land disposition sales;
- maintains an up-to-date computerized landfile with data identifying all completed, producing and expired oil and gas wells in the province;
- prepares special reports for use by department officials;
- informs the resource industry of its responsibilities under existing legislation and changes thereto; and
- maintains close liaison with other branches of the department on revenue and mineral ownership matters.

This branch is divided into two sections: revenue processing and revenue monitoring. Revenue processing is responsible for maintenance of the taxroll; receiving and recording of revenue; verification and processing of revenue returns; billing of various royalties, rentals and taxes; taxpayer information and assistance relating to resource taxation legislation, requirements and procedures; maintenance of computer systems and their interface with other department and government systems; processing and payment of incentive grants, compensation payments and payments to holders of trust certificates; and maintains records of all Crown and freehold mineral ownership; verifies Crown mineral lands available for Crown mineral land disposition sales; verifies mineral land ownership for every well that is licensed; maintains a taxable freehold land ownership base for purposes of mineral rights tax assessment.

Revenue monitoring is responsible for office and field audits in all resource revenue areas, follow up of delinquent returns, collection of accounts receivable and informing taxpayers of resource taxation legislation.

The main objectives of the branch are to ensure that resource revenues owing to the province are received when due, that the amounts paid are correct and properly accounted for, that data is available on a regular and accurate basis for preparation of financial reports, and that a mineral land record of all Crown and freehold land is maintained. To attain these objectives, the branch is committed to a continuous program of review and improvement to existing systems and procedures, or to the development of new systems.

Other objectives include continued and improved communication with taxpayers and the resource industry, greater involvement in policy decisions affecting resource revenues, and training and upgrading of staff to improve the branch's efficiency.

Legislation

The Mineral Revenue Branch administers the revenue provisions of numerous acts, regulations and agreements. Among the more significant are:

The Mineral Resources Act, 1985

The Petroleum and Natural Gas Regulations, 1969

The Oil and Gas Incentive Regulations

The Mineral Dispositions Regulations, 1986 including Uranium Royalties

The Delayed Payment Charges Regulations, 1970

The Oil Well Income Tax Act and Regulations

The Freehold Oil and Gas Production Tax Act and Regulations

The Mineral Taxation Act, 1983
- The Freehold Coal Production Tax Regulations
- Regulations pertaining to Mineral Rights Tax

The Crown Minerals Acts, 1985

The Potash Resource Payment Agreement

The Builders' Lien Act

Revenues

An increase of 50% in total resource revenues was experienced during this fiscal year. Total revenue during 1987-88 amounted to $466.4 million, an increase of $155.3 million over 1986-87.

The Mineral Rights Tax Act was amended to increase the tax rate to $1.00 per acre from $0.50 per acre. In order to parallel the exemption provisions enjoyed by individuals, agricultural corporations were specifically identified as being eligible for a 3,200 acre exemption.

Source of Revenue	1987-88	1986-87	Per cent Increase (Per cent Decrease)
Heritage Fund			
Oil and Gas	$369,439,481	$234,812,562	57.3
Potash	48,899,530	36,982,151	32.2
Uranium	19,717,516	17,807,026	10.7
Other Minerals	20,437,841	15,405,157	32.7
Total	$458,494,368	$305,006,896	
Consolidated Fund			
Mineral Land Tax	$ 5,917,236	$ 3,366,993	75.8
Interest and Penalty	19,774	2,416	718.5
Sales, Services, etc.	310,846	276,030	12.6
Receipts from other Governments	1,695,000	2,490,746	(32.0)
Total	$ 7,942,856	$ 6,136,185	

Incentives and Compensations

Payments under The Oil and Gas Incentive Regulations that were suspended in 1986-87 were continued in 1987-88 with payments totalling $14,241,690. These payments were handled as tax exemptions and were offset against revenue. Compensation payments to former mineral owners were $2.3 million in 1987-88 compared to $2.3 million paid in 1986-87. The former mineral owners were those who had producing properties in excess of 1,280 acres that were acquired by the Crown under the provisions of The Oil & Gas Conservation, Stabilization and Development Act.

Certain mineral rights surrendered to the Crown were encumbered by gross royalty trust certificates. As these lands are leased and brought into production, the branch pays the applicable gross overriding royalty. Payments in 1987-88 totalled $114,665 compared to $133,358 in 1986-87.

Personnel and Administration Branch

The objective of this branch is to facilitate the delivery of department programs by providing a variety of personnel and administrative services to department staff. Specific areas of responsibility include:

- **Human resource management**
  The planning, organizing and implementing of personnel activities related to the recruitment and selection of staff, classification, staff development, employee relations, administration of government policies and the processing of all personnel transactions, are handled by this branch.

- **Financial management**
  The Branch assists in the development of a department budget strategy and manages the processing of all financial transactions, preparation of financial statements, forecasting of expenditures and budget control. Specific processing activities are handled on a daily basis by the accounts group. Total department expenditures for 1987-88 were $12,260,420.16.

- **Property and Procurement Control**
  Through the purchasing section, all equipment, furniture and supplies are purchased and delivered, a central stockroom is maintained, office space is acquired or changed and physical moves are undertaken. Other activities include: acquisition and control of equipment and supplies, print procurement, and rental of photocopiers.

System Services Branch

System Services provides planning, management, consulting and co-ordination support functions for the development of new and the maintenance and operation of existing information systems for the department. This includes responsibility for the evaluation and acquisition of computer hardware and software, data-entry, data security, word processing co-ordination and support and the development and management of the department's computer services budget.

System analysis, development and maintenance are performed by branch staff or co-ordinated with consultant services. The department currently runs 18 computer systems on a regular production basis.

The automated systems use a variety of equipment and computers. The branch operates a remote job entry terminal that provides the communications link between the department and Westbridge computers. In addition, on-line terminals and micro computers are available for on-line data processing, program development and maintenance.

Work was completed on:

- Implementation of an AutoCAD system for plotting Well Location Maps
- Integrating production data to the Well Information System.
- System changes relating to gas deregulation.

Further work was done on:

- Preparation of a Department Strategic Technology Plan.
- Re-development of the Production and Disposition System.
- Development of a Production Monitoring System.

Marketing and Publications Branch

The Marketing and Publications Branch is responsible for providing up-to-date accurate data to the oil, gas and mining industry. This branch also prepares and distributes information on Saskatchewan resources to the public and for the use of students and teachers.

In the last fiscal year staff responded to an average of 75 requests for education materials per month. Sales of technical materials totalled $268,416.06 in 1987-88, as compared to $234,392.32 in 1986-87.

This branch is also responsible for maintaining a daily newspaper clipping service for the minister's office and senior management, as well as a resource library for use of staff and industry.

Resource Policy and Economics Division

Pat Youzwa
Assistant Deputy Minister (Acting)

The Resource Policy and Economics Division conducts research and analysis of policy issues related to energy and mineral resource development. Information and recommendations are provided to government to assist in the formulation of policies respecting such matters as: deregulation of natural gas markets and prices; developments affecting international and interprovincial trade; the rate of development of the province's energy and mineral resources; the pricing and taxation of resources; market development; research, development and demonstration activities; and nonconventional and renewable energy resources. The division also carries out negotiations with the federal government and other provincial governments on issues of mutual concern in the mineral and energy sectors.

Specific objectives of the Resource Policy and Economics Division are to:

- monitor and analyse the resource markets, industry structure and performance, and comparative fiscal systems to provide informed assessments for senior management;
- anticipate emerging issues and assist in the development of appropriate policies, strategies and fiscal instruments with which the department can meet its mandate;
- analyse departmental policies and fiscal instruments to ensure that they remain appropriate and effective in meeting the department's mandate;
- negotiate major federal/provincial fiscal issues and arrangements regarding energy and mineral resources;
- develop and manage royalty and taxation systems in relation to the mineral resources of the province (in order to maintain a balance between a fair economic return to the province and incentives to industry);
- produce timely and accurate forecasts of capital investment, production, royalty revenue and employment in mineral industries;
- develop policies and strategies to promote technologies that will lead to more cost-effective and efficient recovery and utilization of our energy resources;
- design and deliver appropriate research, development and demonstration funding programs; and
- maintain an awareness of, and advise the government on technology issues, problems and opportunities within the energy sector.

Policy Analysis Branch

The four main functions of this branch are to:

- monitor and assess changes in the external policy and market environment in which industry operates;
- co-ordinate the department's economic forecasts;
- conduct economic and financial evaluations of projects and policies relating to the production, processing, distribution, marketing, pricing and taxation of the mineral and energy sectors;
- develop and recommend policy and strategic options and instruments for the mineral and energy sectors; and
- participate in federal/provincial negotiations on issues of joint interest in the mineral and energy sectors.

To fulfill these responsibilities, the professional backgrounds of personnel in the branch encompass a broad range of skills necessary for evaluation, co-ordination and/or initiation of issues or policies. Close liaison with both industry and other branches of the department ensure that policies developed are timely, effective and sustainable.

Oil

The primary oil-related activities of the branch in 1987-88 centered around the federal/provincial issues. Provincial positions were developed in conjunction with the Petroleum and Natural Gas Division. Specifically:

- The federal "Energy Options" process is being monitored to ensure that Saskatchewan concerns are fully recognized in the final report to be released in 1988.
- A Saskatchewan document "Energy Security Issues" was tabled at the meeting of federal/provincial energy ministers in August, 1987. The paper concluded:
  - that energy security problems be solved in the context of market prices, free trade and rational economic decision-making;
  - that Saskatchewan's large known reserves of heavy oil, if upgraded, could become a major Canadian source of light crude oil;
  - that continued government efforts are needed to support research and development aimed at improving recovery technologies.
- The Policy Analysis Branch analyzed the impact of the Free Trade Agreement on the oil industry in Saskatchewan.

The Policy Analysis Branch worked closely with the Canadian Energy Research Institute to develop a model which estimates an oil supply curve. The model predicts future drilling and production levels based not only on economic variables, but also on the geological base.

Natural Gas

The branch has been instrumental in developing deregulation policies for Saskatchewan. The natural gas sector was deregulated in a two-phase program

during 1987. Phase 1 eliminated government regulation of gas pricing, introduced a price-sensitive royalty and introduced a tax on production from freehold lands. Phase 2 introduced direct sales giving Saskatchewan consumers the choice of buying from SPC or directly from natural gas producers. Producers were provided enhanced access to markets outside Saskatchewan while SPC consumers were assured security of supply.

The impact of the deregulation initiatives has been substantial. Natural gas producers drilled a record 568 wells in 1987 (compared to 233 in 1986). By March 31, 1988, producers and small gas plants were supplying 26.8 bcf on an annual basis directly to 26 consumers in Saskatchewan and 39.7 bcf on an annual basis to markets in eastern Canada.

Natural gas deregulation will continue to create new opportunities for producers to explore and develop new reserves, to meet new market opportunities inside and outside Saskatchewan and provide increased employment, investment and revenues in the province.

The government's drive to self-sufficiency has been highly successful resulting in sufficient reserves to meet Saskatchewan demand. A major contributing factor to this success has been the development of reserves and deliverability stimulated by the enhanced access to both internal and external markets. The Policy Analysis Branch administers both the gas removal and gas use permits and monitors the exploration and development of natural gas reserves.

The Canadian natural gas sector continues to go through a period of transition and restructuring as a result of implementation of the Agreement on Natural Gas Markets and Prices signed in October 1985. The intent of the agreement was to reduce significantly the degree of government regulation of natural gas markets, allowing prices to be determined through negotiation between buyers and sellers and giving producers and consumers access to competitive markets. Throughout 1987-88, the Policy Analysis Branch has participated in the Gas Monitoring Committee which represents all signatory governments to the agreement.

Potash

As in the past, the branch's potash responsibilities included market analysis and market development to facilitate potash sales in overseas markets. The branch also was involved in the analysis which supported introduction of the Potash Resources Act and in monitoring and assessing the impact of the anti-dumping suit that U.S. producers filed against the Canadian potash industry.

During the year, branch members:

- prepared a number of papers analyzing the anti-dumping suit and Canada's options for responding to it;
- prepared analytical and background papers related to the Potash Resources Act and served as technical advisor on the minister's tour of potash communities;
- assisted in the preparation of the annual 10 year forecast of world potash markets;
- wrote monthly analyses of potash markets for the minister's use;
- conducted a market development study of India and Sri Lanka that recommended ways that government and industry can improve Canada's position in these potash markets;
- organized a trip to India by the minister, where she met the ministers and senior officials responsible for potash purchasing and usage;
- organized a visit to Saskatchewan by Liu Yi, the Chinese Minister of Commerce, whose responsibilities include potash distribution. The branch also organized a day of potash-related activities for Gao Dezhan, the Governor of Jilin Province and now Minister of Forestry. In both cases, the aim was to increase awareness of Saskatchewan's strengths as a supplier;
- analyzed the impact of Free Trade Agreement on the potash sector and participated in a forum on free trade in North Dakota;
- served as technical advisor to Saskatchewan Education on a video about the potash industry.

Uranium

The principal ongoing responsibilities of the Policy Analysis Branch continue to be the monitoring of the provincial, national and international uranium industry; and the evaluation and analysis of policy and international uranium market issues and trends.

During 1987-88, the main issue of concern for the Canadian uranium industry was the continued growth of protectionism within the United States. Both legal and legislative initiatives which could restrict the import and use of foreign uranium in this market continued to generate considerable uncertainty and concern. Currently over one-half of the uranium mined and milled in Saskatchewan is exported to the U.S. Policy analysis staff have maintained close contact with industry and federal government officials regarding developments in the U.S. and in other key uranium markets.

During 1987-88 branch staff were involved in providing support to the Saskatchewan Trade Negotiations Secretariat in their negotiations with the federal government for inclusion of provisions covering uranium industry access to the United States uranium market in the Canada-U.S. Free Trade Agreement. The Free Trade Agreement, which is scheduled to come into force in January 1989, contains provisions which would exempt Canadian uranium from any protectionist restrictions which may be put in place to protect the U.S. domestic uranium industry.

In return, the Free Trade Agreement provides that the Canadian further processing policy would no longer apply to uranium exports to the U.S. This

policy requires that yellowcake be processed in federal Crown-owned processing facilities located in Ontario into uranium hexafluoride prior to export. Saskatchewan has opposed the continuation of this policy because it constrains Saskatchewan producers in their pursuit of export contracts for yellowcake.

During 1987-88 as well, the federal government announced a relaxation of its foreign ownership restrictions for uranium developments to permit a greater degree of foreign investment while retaining a requirement that effective ownership control remain in Canadian hands. The Saskatchewan government has consistently argued for relaxation, and ideally elimination, of this policy. The federal announcement is viewed as a positive step by both the province and its uranium producers because it will permit greater flexibility for the financing of future uranium development projects.

The Policy Analysis Branch also provides analysis and advice to the government regarding a broad range of uranium and nuclear related issues of general concern to the Saskatchewan public.

Technology Branch

The Technology Branch is responsible for encouraging the development and application of innovative technologies related to Saskatchewan's large reserves of petroleum and lignite. Saskatchewan will derive substantial economic benefits through the development of more efficient or less expensive technologies for producing and utilizing these energy resources.

To accomplish this objective, the major activity of the Technology Branch is planning and implementing of various funding programs to provide financial support to desirable research, development and demonstration (r, d & d) initiatives related to petroleum and lignite. The branch also:

- monitors r, d & d activities in Saskatchewan, Canada and in other countries in order to maintain a current perspective on new technologies related to petroleum and lignite; and
- handles any alternative energy and energy conservation issues referred to the department.

During the past year, the Technology Branch has represented Saskatchewan on the Intergovernmental Secretariat which supports the Action Committee on Western Canadian Low-Sulphur Coal to Ontario. The Action Committee is chaired by Canada's Deputy Prime Minister and the Ontario Premier is the Vice-Chairman. The Premiers of Saskatchewan, Alberta and British Columbia are the other members of the Committee. The Action Committee was established to investigate means to improve the competitiveness of western Canadian coal in the Ontario market. In January, the Intergovernmental Secretariat submitted to the Action Committee a report which recommended a number of initiatives which could be pursued in a co-operative manner by the Action Committee and the private Sector.

For the past several years, the Technology Branch has administered the Canada-Saskatchewan Heavy Oil/Fossil Fuels Research, Development and Demonstration Program. This program expired at the end of 1987-88. During the year, the Technology Branch developed a new energy technology funding program to succeed the Heavy Oil/Fossil Fuels Program. The new Saskatchewan Fossil Fuels Technology Development Program will provide an important mechanism for continuing the development of Saskatchewan's energy resources.

The Heavy Oil/Fossil Fuels Research, Development and Demonstration Program

This program encouraged research activity and the demonstration of new technologies associated with heavy oil, lignite and the enhanced recovery of light oil.

The high density and high viscosity of heavy oil combined with the thin, unconsolidated sandstone reservoirs in which it is found make it difficult to produce. Only five % of the heavy oil-in-place can be produced by primary recovery techniques. As well, heavy oil is difficult to transport and needs to be upgraded to increase its utilization.

Lignite is a low quality coal. Its high moisture content, high ash content and low energy content limit the potential uses for lignite, reduce its value, and restrict the distances over which it may be transported economically.

Saskatchewan and the federal government agreed to share the costs of the Heavy Oil/Fossil Fuels R, D & D Program in order to develop the technology required to overcome these constraints inhibiting the development of our heavy oil and lignite resources. The Heavy Oil/Fossil Fuels Program was implemented under two federal-provincial agreements:

- The Canada-Saskatchewan Heavy Oil Agreement, signed in 1976, and
- The Canada-Saskatchewan Heavy Oil/Fossil Fuels Agreement, signed in 1983.

As of March 31, 1988, these two agreements provided a total of $29.2 million to 52 projects approved under the terms of the program.

Since the program expired at the end of 1987-88, no further projects will be approved. A limited amount of funding will be provided in 1988-89 and 1989-90 to complete outstanding commitments.

The program's major accomplishments in 1987-88 were:

- In October, Sceptre Resources Limited and Murphy Oil Company Ltd. successfully drilled the first horizontal oil well in Saskatchewan. Horizontal well technology has the potential to reduce significantly production costs and to increase substantially the amount of heavy oil that

may be recovered from a reservoir. The performance of the well will be monitored for two years. If the pilot project is successful, commercial-scale development may be undertaken at the project site as early as 1990.

- An agreement was reached between Saskatchewan Energy and Mines and Husky Oil Operations Ltd. to carry out a pilot project to identify the optimum processes and conditions for the economic recovery of heavy oil using short, hydraulically drilled, horizontal drainholes from existing conventional vertical wells. Horizontal drainholes have the potential to be used in both primary and tertiary operations to resolve some common production problems, increase production and improve overall recovery.

In 1987-88 the Heavy Oil/Fossil Fuels R, D & D Program provided over $4.2 million in funding to the following 33 projects:

- Study of Heavy Oil Potential of Mississippian Carbonate Rocks of South Saskatchewan.
- Development of an Automatic Variable Speed Controller for Heavy Oil Applications.
- Development of an Electronic Continuous Fluid Level Monitor.
- Remote Sensing for Petroleum Exploration and Exploitation in Saskatchewan.
- Feasibility Study of the Design and Economics of a Shaft for the Recovery of Heavy Oil.
- Evaluation of the Potential for Application of Shaft and Tunnel Access, Gravity Drainage Enhanced Oil Recovery Techniques to Saskatchewan Oil Reservoirs.
- Combustion Tube Studies for Saskatchewan Oil Reservoirs.
- Thermal Studies of Saskatchewan Heavy Oil Core Samples.
- Fluid Characterization of Saskatchewan Reservoirs.
- Enhanced Heavy Oil Recovery by Carbon Dioxide Injection.
- Characterization and Treatment of Saskatchewan Heavy Oil Emulsions.
- Evaluation of Upgrading Characteristics of Saskatchewan's EOR Feedstocks and Distillate Fractions
- Enhanced Oil Recovery by Steam Injection.
- High Pressure Miscible Displacement in Saskatchewan's Light and Medium Oil Reservoirs.
- Petrographic Studies of the Ravenscrag Coal Deposits.
- The Production of Saskatchewan Heavy Oil Using Steam Assisted Gravity Drainage.
- The Amflo Pilot Project.
- Development of Upgraded Lignite Fuel.
- Demonstration Trial of a Continuous Surface Mining Machine.
- Potential Environmental Effects of Drilling Fluids on Crops and Soils in Saskatchewan.
- Eyehill In-Situ Dry Combustion Project Data Base.
- Boundary Dam CO_2 Pilot Plant.
- Marketing Study of Saskatchewan Lignite.
- Evaluation of Heavy Oil/Fossil Fuels Program.
- Technical Authority for Tangleflags Pilot Project.
- Micro-FTIR and UV-Fluorescence Spectroscopy of Coal.
- Tangleflags North Steamflood Pilot Project.
- Pyrolysis and Oxidation of Saskatchewan Heavy Oils.
- Coal-Water-Fuel Product Testing.
- API Gravity Improvement of Saskatchewan Heavy Oils Using Low Conversion Upgrading Processes.
- Improved Oil Recovery — Viking Sand Production.
- Chemical Changes During Thermal Recovery of Saskatchewan Heavy Oil.
- Field Test of Hydraulically Drilled Drain Holes for the Recovery of Lloydminster Heavy Oil.

Further information is available from the Technology Branch regarding the new Saskatchewan Fossil Fuels Technology Development Program and the projects funded under the Heavy Oil/Fossil Fuels R, D & D Program.

Fiscal Management Branch

The Fiscal Management Branch is responsible for designing, implementing, monitoring and evaluating tax and royalty systems for the mineral resources of the province. The branch prepares forecasts of economic activity, production, revenues and expenditures for the mineral sector and monitors the worldwide activities of the potash and uranium industries. The branch also administers the funding and monitors the activities for research and development programs in potash production, marketing and agronomics. The branch reviews the sales of uranium to ensure that sales are made at fair market value in order to protect the royalties due to the Crown and to obtain an assessment of the uranium markets. The branch provides assistance to industry officials and other government agencies in the interpretation of agreements, regulations and statistical and operational information regarding the potash and uranium sectors.

Potash

The major emphasis of the Fiscal Management Branch was related to the anti-dumping action brought by the U.S. producers against the Canadian industry. The branch also assisted with the Potash

Resources Act and regulations thereunder to implement the program.

The branch continued to administer the market development and research and development incentive programs. During the year, the branch worked with the Saskatchewan Potash Producers Association to develop a proposal for joint funding of a five year research and development program.

The branch reviewed the royalty regimes applicable to several other mineral commodities produced in the province and recommended changes where industry circumstances and market conditions had changed. The branch continued to monitor industry activity and provide information as well as economic and revenue forecasts for departmental use as well as by other government departments.

Uranium

The world production of uranium was less than consumption for the third consecutive year leading to a reduction of inventories although global stocks remain very high. Paradoxically there has been an increase in U.S. inventories as U.S. buyers increase purchases of foreign-sourced uranium and conserve U.S. sourced uranium in anticipation of possible restrictions on the enrichment of foreign uranium or the use of foreign uranium by U.S. utilities. This uncertainty in the U.S. created a surge of buying on the spot market which boosted Saskatchewan sales and production in the year.

The branch continued to improve the computer programs that are used in forecasting and analysis of sales and production statistics. Further development work was made on the computer model used for royalty calculations and analysis of the royalty system. The basic royalty was increased to five % for the coming fiscal year.

Special Projects Branch

The Special Projects Branch is responsible for the department's involvement in major energy projects and trade related matters affecting mineral and energy commodities.

More specifically the branch:

- is responsible for the NewGrade and Husky bi-provincial upgrader projects;
- assesses the impacts on Saskatchewan's mineral and oil sectors of any developments in the international trade area; and
- prepares response options for the province with respect to developments in this area and co-ordinates the implementation of any response the province may wish to undertake.

During the past year the branch was involved in ongoing negotiations with respect to the Husky bi-provincial upgrader at Lloydminster.

The branch was actively involved in monitoring trade actions in the United States with respect to potash and uranium. A large part of this involved ongoing work with the Trade Secretariat on matters relating to the Canada-U.S. Free Trade talks and their possible impact on the province's resource sectors.

Geology and Mines Division

Les Beck
Executive Director

The division is responsible for the maintenance of a geoscientific and mining data base for the department, and for the disposition of all Crown minerals other than petroleum, natural gas, oil shales and helium.

Geoscience data are collected in two ways: firstly, by division staff directly through various geological surveys and projects, and secondly, by means of industry exploration and production records made available under statute.

The primary objective of the division is to promote exploration and development opportunities in the petroleum and mineral sectors through publications, data files, core collections, symposia, open-house meetings and individual consultations, and by responding to direct inquiries from industry and the general public.

As part of the general downsizing of the public service in May 1987, the Geological Survey Branch was eliminated, although the name "Saskatchewan Geological Survey" is retained to identify geoscientific activities carried out by the division. For the remainder of the fiscal year, the responsibilities of the division were undertaken by five branches: Precambrian Geology, Sedimentary Geodata, Petroleum Geology, Mineral Development and Mines, together with a Support Services Section which undertakes cartographic drafting and editorial duties for the division and provides general drafting services for the department.

Precambrian Geology Branch

The role of the Precambrian Geology Branch is to compile and maintain an ongoing inventory and to produce models of the regional and mineral deposit geology, geochemistry and related geoscience data for the northern Precambrian Shield region of the province. This information is used primarily by the mineral exploration industry, but also supports other development and diversification programs. The section interfaces strongly with the Mineral Development Branch in these activities.

Field Program

The field program is currently funded under the Canada-Saskatchewan Mineral Development Agreement of ERDA 1984-1989 (the MDA), a geoscience program aimed principally at stimulating and assisting the mineral exploration industry to explore for and develop gold and precious metal mines in northern Saskatchewan. The program has a total budget over five years of approximately $6 million, split 50:50 on a joint delivery basis between the federal and provincial governments. The federal component, managed by the Geological Survey of Canada, comprised airborne geochemical and geophysical surveys, as well as detailed mineral deposit and regional geological studies.

The provincial component of the MDA, the "Gold Belt Geology" program, includes geological mapping, geochemistry, isotope geology and related mineral deposit studies in areas which are currently undergoing very active exploration for gold. The provincial operation was largely confined again in 1987-88 to the triangle of country between La Ronge, Reindeer Lake and Flin Flon (Figure 1).

Some MDA projects are undertaken by the Mineral Development Branch and are described under that heading. Expenditures on the MDA geoscience program totalled $458,400 in 1987-88.

Bedrock Geological Mapping

Mapping programs continue to be rated foremost in aiding the mineral exploration industry's current search for gold in northern Saskatchewan. The four year mapping of the Central Metavolcanic Belt (the "La Ronge Gold Belt") northeast of La Ronge was completed in the Missinipe area in the south (A, Figure 1). This region is now prime gold exploration terrain with promise for the development of several mines. Trace element geochemical maps were produced for the northern part of the belt (B, Figure 1). Work, begun in the Laonil Lake area in the previous year, was extended to Carruthers and Uskik Lakes to the southeast (C, Figure 1). Gold exploration developments in the Laonil Lake region are also continuing to offer high potential for mine development.

A mapping probe was made in the Pine Channel area on the north shore of Lake Athabasca (D, Figure 1), an area known for many years for its gold showings, and in which there is some current industry interest.

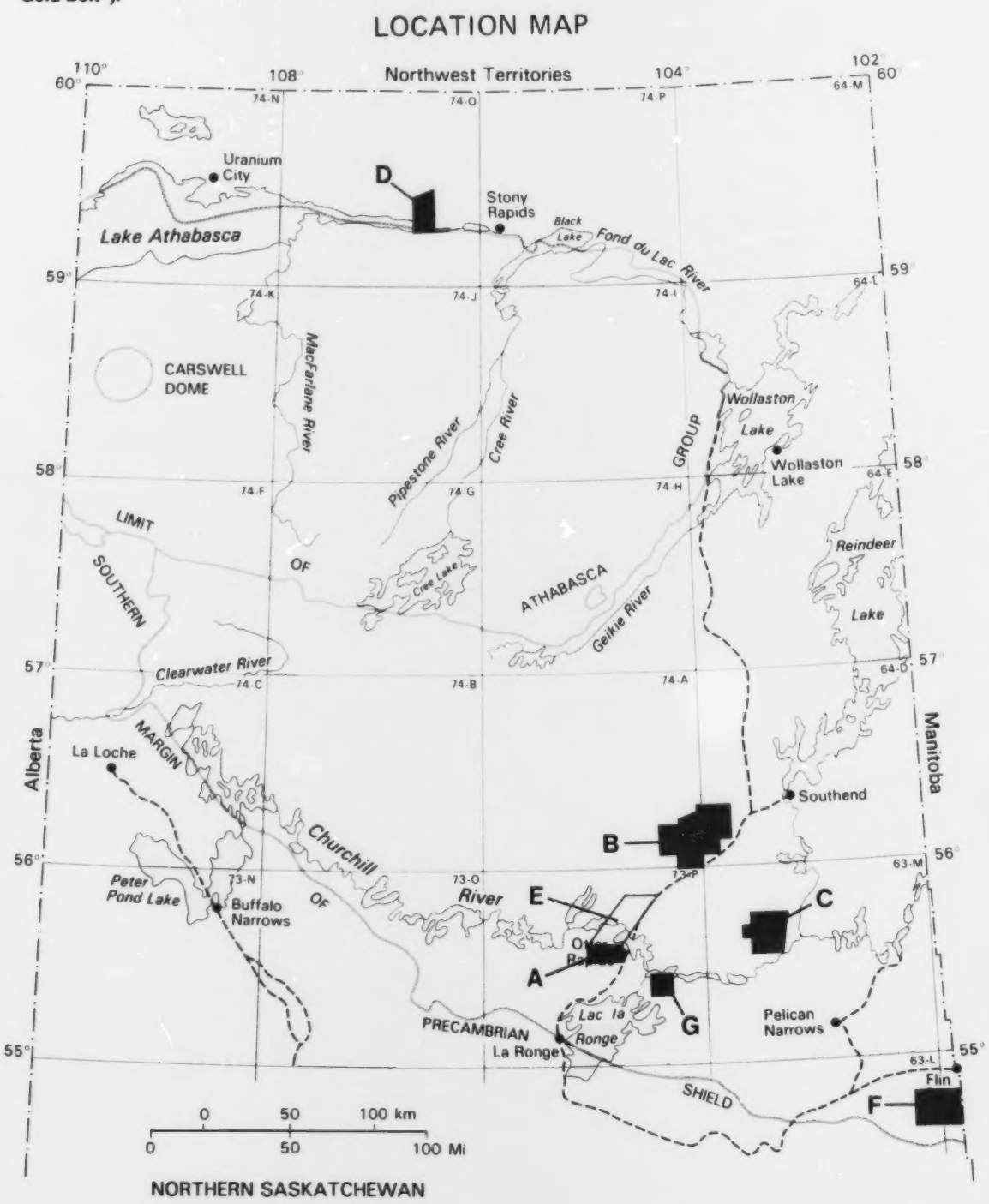
Supporting Studies

A number of projects supportive of the regional geoscience program were mainly contracted out to, or joint-ventured with, university personnel, as in previous years. Geochemical studies were continued in the La Ronge area (E, Figure 1), and an earlier study in the Amisk Lake area was augmented with rare earth element analyses (F, Figure 1); both of these studies were contracted to the University of Regina.

Joint-ventured geochronological and isotope geology studies were continued with the University of Kansas. This work included the second year of bedrock mapping of an area around Nistowiak and Iskwatikan Lakes (G, Figure 1). Samples were collected by M. Bikerman for geochronological determination through a Carleton University project. A pilot study of the pressure-temperature characteristics of mineral assemblages in the Pelican Narrows area was initiated in collaboration with the University of North Dakota. The results of the geochronological and associated studies help to provide a chronological framework for classifying bedrock units in the north, leading to improved exploration models.

A review study was made on rare earth elements in Saskatchewan in response to the rising interest in these elements.

Figure 1 - Precambrian Geology Branch field projects under the ERDA Program. Letters show approximate location of projects described in text. Areas under A, B and E coincide approximately with the Central Metavolcanic Belt (the "La Ronge Gold Belt").



Precambrian Geodata

The regional geoscience data base includes rock and mineral sample collections and other files which are available for consultation. These files continue in process of full computerization (mainframe and micro). Microcomputer databases were also initiated to catalogue geochronological determinations in northern Saskatchewan, and a Precambrian Lexicon database was developed further. Trials were initiated with CAD software for the preparation of small maps and other graphical information.

Publications and Presentations

Published and open file reports are issued periodically, based upon field programs, consultants' reports and in-house compilations.

Coloured compilation bedrock geology maps now cover over 60% of the Precambrian Shield area in first edition (Figure 2). During the year, work was started on one preliminary map (74N), one preliminary map was released (74F), and three more maps were in preparation for final colour publication (64L, 64M, and 74B).

Branch geologists also contributed the major part of the Saskatchewan Geological Survey Open House presentation in November 1987, attended by mineral industry representatives from across Canada and the United States. Presentations were also made at other meetings held in North America.

Sedimentary Geodata Branch

Industrial Minerals Section

The principal responsibilities of the section are technical advisory, research, planning, regulatory and informational. The section is frequently consulted on technical matters relating to the field of industrial minerals in general and to provincial resources in particular. Monitoring the exploration and development of industrial minerals is conducted through the evaluation of technical submissions by industry and by personal communications. Planning and implementation of resource investigations are based on industry and community needs and on changing technological and market trends and opportunities. The section maintains and augments a technical data base on industrial mineral resources, including assessment work submitted by industry, departmental and joint federal/provincial project results, and general information on industrial minerals.

Other functions of the section relate to:

- the review of Environmental Impact Assessments on proposed mineral developments;
- a technical advisory and planning role for the Technology, Development and Geoscience Sectors of the Canada-Saskatchewan Mineral Development Agreement;
- participation in the revision of mineral related regulations;
- administration of specific sections of the Quarrying Regulations and the Coal Disposition Regulations; and
- review of technical work submitted by industry in the exploration and development of industrial minerals.

Several projects were in progress during the fiscal year:

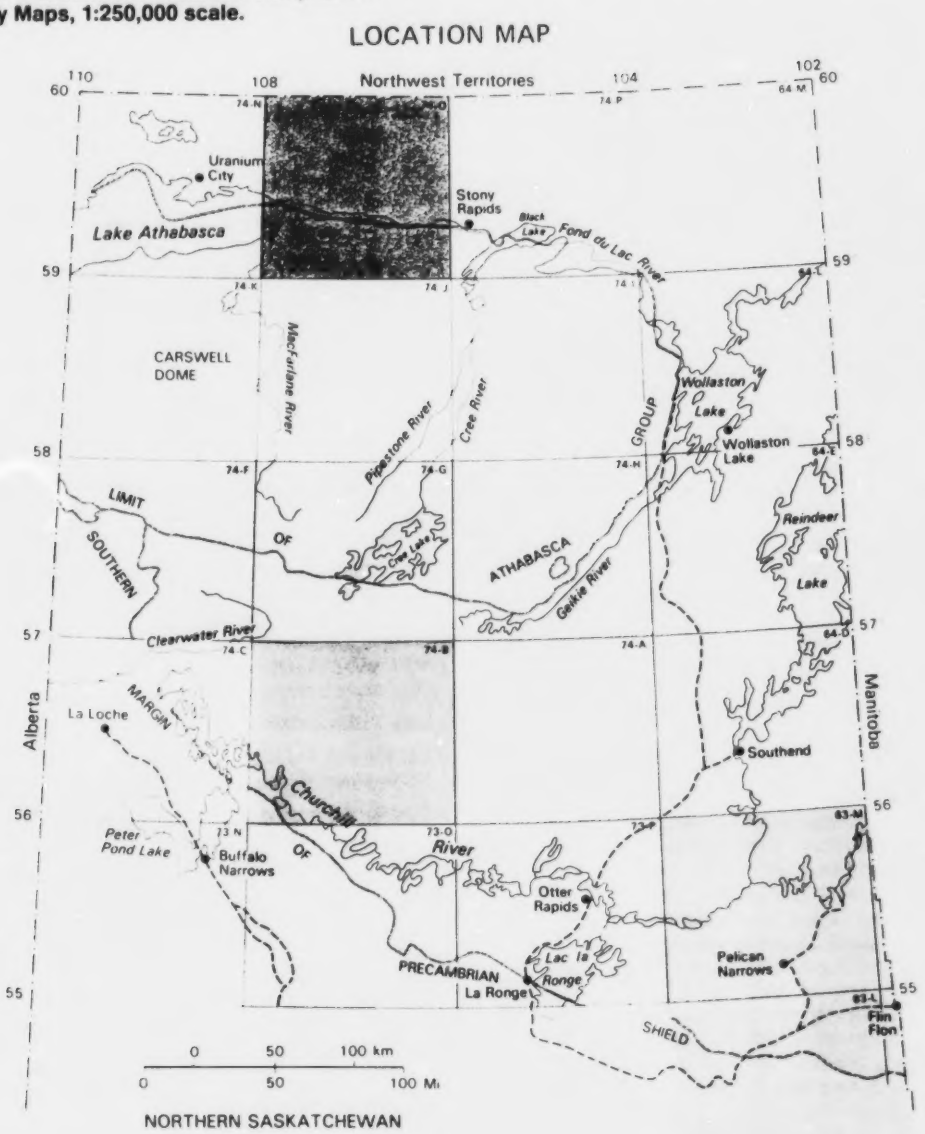
- Compilation of Potash Mine Geology and Analytical Data: This is an ongoing project designed to monitor and interpret the geological conditions in potash mines. The project relies on the submission of data by industry and on investigative work by the staff.
- Compilation of a Coal Data Base: The project is ongoing and directed toward the synthesis of all coal related data in the province into an integrated data base.
- Building Stone Project: This project is a preliminary investigation of potential building stone resources. It provides the background required for more detailed investigations under the Canada-Saskatchewan Mineral Development Agreement, and the Northern Economic Development Subsidiary Agreement.
- Compilation of an Industrial Minerals Map: The map was near completion by fiscal year end.

During the fiscal year the section contributed two papers for publication in professional journals:

- Industrial Minerals of Southern Saskatchewan, a Field Trip Guidebook for the Geological Association of Canada and Mineralogical Association of Canada; and
- Saskatchewan's Mineral Industry: Past and Present (jointly authored) for the Canadian Institute of Mining and Metallurgy.

A total of 141 inquiries on technical, economic and regulatory matters relating to industrial minerals were handled by the section. Most of the inquiries originated with industry and other government agencies. Figure 3 illustrates the distribution of inquiries.

Figure 2 - Precambrian Bedrock Compilation Geology Maps, 1:250,000 scale.



Preliminary monochrome edition published 1987-88

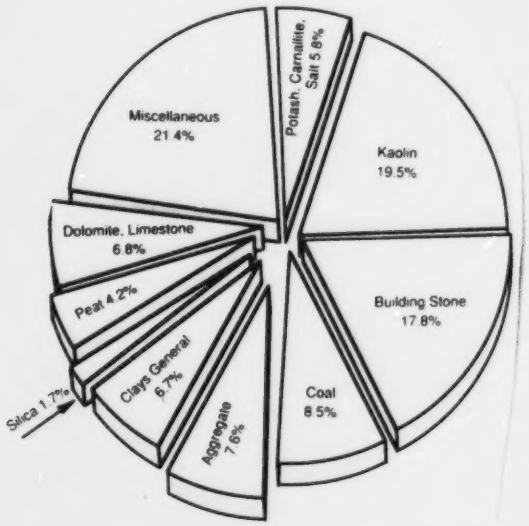
Full colour edition published prior to 1987-88

Preliminary monochrome edition published prior to 1987-88

Full colour edition in preparation 1987-88

Preliminary monochrome edition in preparation 1987-88

Figure 3 - Distribution of inquiries pertaining to industrial minerals.



Well Records and Geophysical Data Section

The section maintains a central repository file of information from wells drilled under the Oil and Gas Conservation Regulations. Information is received, processed, coded for entry into the computerized system and filed. The section also receives, processes and maintains files of preliminary and final plans, monthly and final reports and geophysical maps submitted by industry under the Sedimentary Basin Geophysical Exploration Regulations. The manual and computerized data files are the basis of servicing industry, government agencies and the public. The section also compiles indexes of geophysical data for the quarterly petroleum and natural gas land sales. With the exception of data collection and issuance of geophysical exploration plan numbers, the section has relinquished regulatory functions under the Sedimentary Basin Geophysical Exploration Regulations to the Petroleum Development Branch. During the fiscal year, work was initiated on the computerization of the geophysical map and report files.

The principal statistics relating to the work of the section are summarized in the following table:

Well Files	**1987/88**
Data submissions by industry	11,451
Files pulled	23,758
Photocopies for industry	24,539
New files set up	2,017
Letters requesting delinquent data	601
New wells coded and computerized	969
Supplementary data added to system	2,976
Computer searches	132

Geophysical Data

Preliminary plan numbers issued	400
Final plans approved	270
Monthly reports processed	400
Geophysical maps reproduced for industry	600
Total revenue generated by information services	$51,263

Petroleum Geology Branch

Departmental reorganization created, on June 1, 1987, the Petroleum Geology Branch, consisting of a director, two office staff, a Geology Section and a Warehouse Section.

Geology Section

The Geology Section, consisting of three geologists, replaced and assumed the duties of the previous Petroleum Geology Section (which had five geologists). The Well Information System was kept up-to-date with well logs from 2,035 licensed wells (compared to 1,411 in fiscal 1986-87).

Four cross-sections were added to the southern Saskatchewan grid series, four papers were contributed to the Saskatchewan Geological Survey's Summary of Investigations 1987 and one paper was presented at the Geological Association of Canada meeting at Saskatoon in May.

Three major projects continued:

- Geology of the Medicine Hat Sand (Cretaceous) in Southeastern Saskatchewan.
- Development of a Depositional Model for the Oil-Prone Jurassic Section in the Wapella-Moosomin Area, Southeastern Saskatchewan.
- Geology of the Interlake Group (Silurian) in Saskatchewan.

One project, "Geology of the Dawson Bay Formation (Devonian) in Southwestern Saskatchewan", was transferred with its author to the Sedimentary Geodata Branch.

Professional consultations with industry and other departments were given as usual, and educational lectures and seminars were given to various groups of university, high school and grade school students.

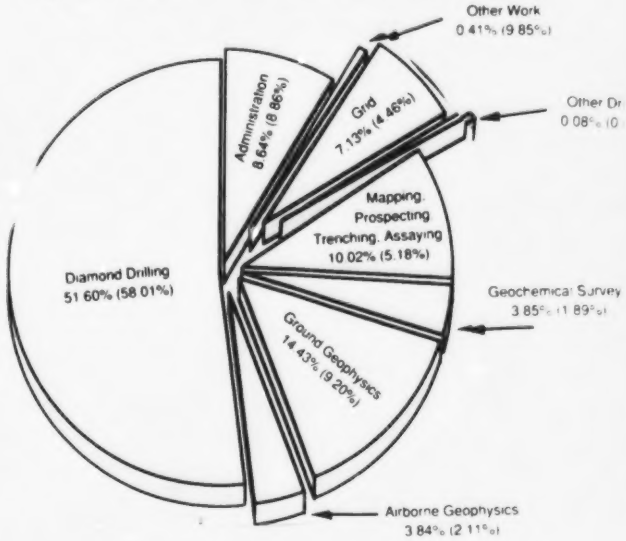
Warehouse Section

The Warehouse Section, consisting of four personnel, replaced and assumed the duties of the previous Subsurface Geological Laboratory Unit. In order to handle the workload, the service of manufacturing rock thin-sections was reduced to an "as time and staff permit" basis. Activities during the fiscal year included the following:

- New cores received amounted to 5,882 boxes from 394 wells, bringing total number of boxes in storage to 272,002.

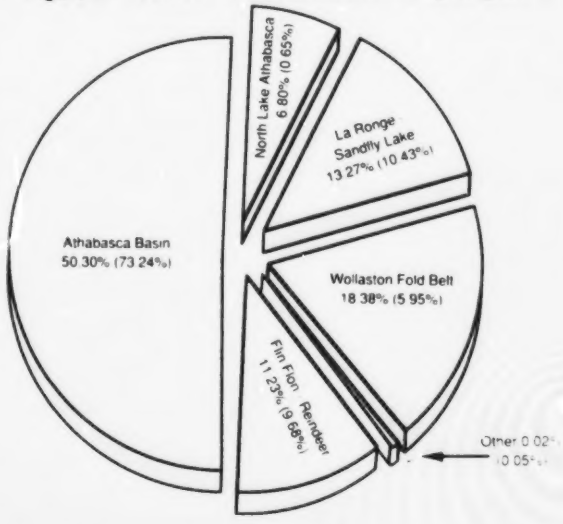
- New drill cutting samples processed amounted to 30,708 vials from 363 wells, bringing total number of vials in storage to 1,979,507.
- New drill cutting samples processed for shipment to Energy, Mines and Resources Canada totalled 26,626 vials from 308 wells.
- Samples shipped to Energy, Mines and Resources Canada totalled 26,418 vials.
- Cores examined on premises totalled 34,375 boxes from 2,329 wells.
- Samples examined on premises totalled 10,560 vials from 352 wells.
- Users of the examination facilities totalled 145. Of these, 122 were from industry and represented 82 companies, while 23 represented six other organizations.
- Cores loaned out from the premises for study and/or analysis in other facilities totalled 1,431 boxes from 73 wells.
- Numbers of rock thin-sections and rock slabs prepared were 235 and 485 respectively.

Figure 4 - 1987-88 Assessment Credits by Activity.



( ) Denotes 1986-87 Figures

Figure 5 - 1987-88 Assessment Credits by Region.



( ) Denotes 1986-87 Figures

Mineral Development Branch

The branch is responsible for evaluating technical reports submitted as assessment work by the mineral industry under the Mineral Disposition Regulations 1986, and for maintenance of the historical exploration record represented by these reports. Also administered are the Saskatchewan Mineral Deposits Index and the offices of the resident geologists in La Ronge and Creighton. In addition, the branch undertakes geological studies of metallic mineral deposits and disseminates information about these, and about mineral industry activities and mineral development opportunities at both technical and general levels.

The yearly volume of assessment submissions provides an indication of the level of exploration activity, although it is not an absolute measure. A total of 1844 submissions were received for claimed expenditures of $31.3 million (down 27% from 1986-87). These are broken down into specific exploration activities in Figure 4 and into regions in Figure 5.

A total of 477 new assessment files were incorporated into the historical record, 92 visitors were received and 144 requests for information handled.

Work continued on computerization of the Saskatchewan Mineral Deposits Index and on documentation of new occurrences. The Index provides a primary reference for mineral exploration and land use planning. A total of 16 requests for index data were processed.

The continuing gold exploration boom in northern Saskatchewan has resulted in an overall high level of information requests.

The resident geologists, through offices in La Ronge and Creighton, monitor the mineral exploration industry in northern Saskatchewan and also assist it by providing up-to-date information on exploration and mining activities and opportunities. In the present fiscal year, the Creighton office was operated only on a part-time basis, and the incumbent resident geologist position transferred to La Ronge to accommodate a staffing cutback in this location. The La Ronge office maintains files of current mineral claims, topographic maps, airphotos, geological maps and reports, and assessment work submissions. In the current fiscal year, over 1400 visitors were received at the resident geologists' offices.

Studies of metallic mineral deposits and their geological settings were continued under the Geoscience Program of the five year (1984-89) Canada-Saskatchewan Subsidiary Mineral Development Agreement. Projects were implemented by branch staff and through contracts with the Universities of Saskatchewan and Regina. Gold deposit investigations were undertaken in the Sulphide Lake area north of La Ronge, a program of studies on a newly recognized type of polymetallic uranium-gold-platinum group element deposit was initiated in the Goldfields area south of Uranium City, and a recently discovered alkaline intrusive complex in the Peter Lake area was evaluated for its rare earth element potential.

The mineralized core collection, stored in La Ronge and administered through the office of the resident geologist, received additions totalling some 5226.5 m from uranium deposits in the Athabasca Basin and from gold deposits in the La Ronge and Flin Flon gold belts. Some 771 m of stratigraphic core were also collected from the Athabasca Basin.

Approximately 100 people examined core from the collection during the fiscal year, for the most part in connection with core displays put on as a part of field trips for the Geological Association of Canada/Mineralogical Association of Canada and International Atomic Energy Authority in May and September 1987, respectively.

The Prospectors' School was conducted by branch staff in conjunction with the La Ronge Community College. The school offers a basic six week mineral prospecting course to students of all ages, primarily from northern communities. A total of eight students graduated. The course is deemed particularly relevant during the present period of intensive gold exploration, as prospecting even in today's age of technology still represents one of the most effective exploration methods.

The 1:250,000 scale metallogenic map series established in 1984-85 received ongoing attention and, although no new sheets were released in 1986-87, three were in editing prior to publication at year end. These maps provide details of location, metal association, development status and type of mineralization, as well as reference to information on all noted mineral occurrences. They augment a similar scale compilation bedrock geology series and provide a valuable reference for the mineral exploration industry.

Section staff gave technical presentations at the annual meeting of the Geological Association of Canada and Mineralogical Association of Canada, at the International Atomic Energy Authority Symposium "Uranium Resources and Geology of North America" and at the 56th Annual Prospectors and Developers Convention.

Mines Branch

This branch is responsible for the disposition, development and conservation of all Crown minerals with the exception of petroleum, natural gas, helium and oil shale. The activities of the branch are carried out through the Mining Lands Section and the Mines and Statistics Section.

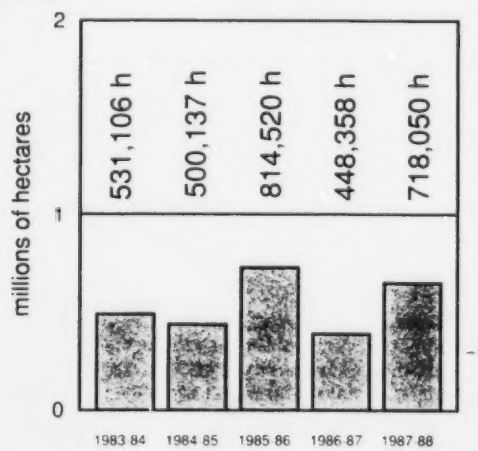
Mining Lands Section

Mining Lands administers and disposes of Crown minerals under the following regulations:

- The Mineral Disposition Regulations, 1986 (uranium, base and precious metals)
- The Quarrying Regulations, 1957 (sand, gravel, clay, bentonite and other quarriable substances)
- Alkali Mining Regulations (sodium sulphate)
- The Coal Mining Regulations, 1957 (coal)
- The Subsurface Mineral Regulations, 1960 (potash, salt)

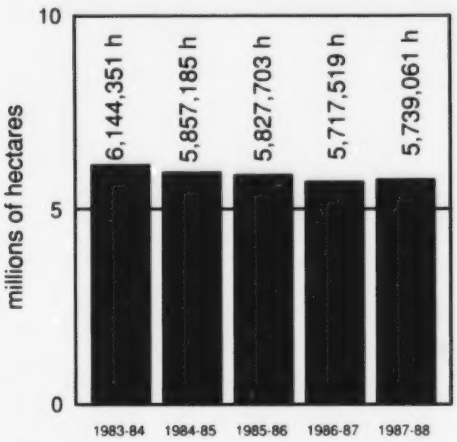
Activities of the section are centred in Regina, but a field office is also maintained in La Ronge to permit local administration of regulations.

Figure 6 - New areas acquired under claims and permits.



A total of 412 new mineral claims covering 718,050 hectares were taken out during the year under The Mineral Disposition Regulations, 1986, an increase of 60% from the area taken out in new claims in the previous year (Figure 6).

Figure 7 - Total areas under disposition (claims, permits, leases)



On March 31 there were 3,603,245 hectares held under 3,787 mineral claims; 1,071,775 hectares held under 16 prospecting permits; and 1,064,041 hectares held under 728 leases. The total area held under disposition was 5,739,061 hectares as of March 31, 1988 (Figure 7).

In the year under review, 15 prospecting permits covering 23,756 hectares and 101 leases covering 6,495 hectares were issued under The Quarrying Regulations, 1957. Of the 15 prospecting permits, four were issued for kaolin, silica sand and clay covering a total of 19,976 hectares. At year end 60,996 hectares were held under 22 prospecting permits and 28,389 hectares were held under 1,120 leases.

An increase in coal activity resulted in 69 coal prospecting permits covering 38,704 hectares and 39 leases covering 6,141 hectares. As a result of the increase, a total of 41,188 hectares were held under 74 coal prospecting permits and a total of 100,597 hectares were held under 603 coal leases at year end. Consultations with industry representatives concerning revisions to The Coal Mining Regulations, 1957 were completed and a final draft of the proposed new regulations was prepared.

No alkali mining leases were issued during the year, leaving the total alkali dispositions held on March 31, 1988 at 34 leases covering 10,408 hectares.

Potash dispositions remained unchanged with six permits covering 145,972 hectares and nine leases covering 194,736 hectares being held at the end of the year.

Mines and Statistics Section

The major functions of the section are to:

- monitor mining developments and operations pertaining to those minerals for which the branch has responsibility;
- collect, process and maintain records and disseminate data related to mineral production;
- prepare revenue and economic forecasts for the base and precious metals sector of the industry;
- co-ordinate the department's response to project proposals referred by Saskatchewan Environment and Public Safety as part of the environmental impact assessment process, and evaluate specifically those proposals pertaining to mining developments; and
- provide technical expertise and assistance to other branches and divisions in the department.

A forecasting program dealing with revenue from and development in the base and precious metals sector of the industry was taken over by the section in June 1987, as a result of reorganization affecting the Policy Analysis Branch. Yearly plans of mining advances were acquired from 19 selected individual mining operations and data on amounts and values of mineral output were regularly collected from 25 mine producers, while the resulting processed statistics were supplied to 37 recipients consisting of government departments, agencies and mining companies.

During the fiscal year, 19 project proposals and Environmental Statements were reviewed by the department, eight of which dealt specifically with mining operations.

Technical expertise in the section was used to provide consultative services that included the review of six submissions under the Potash Resource Payment Agreements and 13 items on various subjects related to mining, and the provision of information on mining operations in response to 25 requests from within and outside the department.

Section staff represented the department in 10 separate meetings on matters related to proposed mining projects.

Support Services Section

The Support Services Section handles the editing and production of all geoscientific reports and maps published by the division and, in addition, provides drafting services to the rest of the department. The section consists of two working units: Survey Drafting and General Drafting.

The Survey Drafting Unit prepares thematic monochrome and colour maps and text figures to the plate-ready stage. These include compilation bedrock geology and metallogenic maps at 1:250,000 scale, outcrop geology and contour maps at various scales, stratigraphic cross-sections, and small-size maps and diagrams for inclusion in reports. During the fiscal year, the unit produced six

publications comprising 695 pages and 22 maps. In addition, approximately 25% of the cartographic staff's time was spent on special projects such as text figures for magazine articles and papers in scientific journals, slides for conference presentations and graphics for conference displays.

Acquisition of a desk-top publishing system with laser printer will enable the section to produce such publications as the annual Summary of Investigations to a high level of quality and with less expenditure of money and staff time.

The General Drafting Unit maintains the mineral disposition maps, well location maps, pool boundary maps and potash and coal lease maps. They also prepare the maps for the quarterly Petroleum Land Sale, produce an annual update of the coloured Mineral Development Map, prepare numerous text figures, slides and graphics for all areas of the department, and handle all small blueprint orders for internal use and for sale through Marketing and Publicatons Branch.

With the acquisition of a state-of-the-art computer mapping system, the unit is now able to produce monthly updates of the department's well location/status maps. This development completes the computerization of a multi-functional map series for which there had not been sufficient staff to carry out an update since October 1985. Other suitable applications are being transferred to the system as quickly as possible. Renewal of the bases for the mineral disposition map series, at a standard scale of 1:50,000, was completed for all high- and medium-priority areas. Work on a new series of tied structure contour maps to replace the old K-series maps was suspended due to the loss of two staff positions and termination of funding.

1987/88 Publications

Fuzesy, A. (1987): Assessment work catalogue, Athabasca area, Saskatchewan; Sask. Energy Mines, Misc. Rep. 87-6, 132p.

Gracie, A.J., Gray, L.J. and Boissoneault, G. (1987): Index to La Ronge core collection; Sask. Energy Mines, Data File 12, 162p.

Macdonald, R., ed. (1987): Summary of Investigations 1987, Saskatchewan Geological Survey; Sask. Energy Mines, Misc. Rep. 87-4, 224p (plus 18 maps).

Parslow, G.R. and Gaskarth, J.W. (1988): Geochemistry of the Hamell Lake area, Saskatchewan; Sask. Energy Mines, Open File Rep. 87-4, 73p (plus 1 map).

Saskatchewan Geological Survey (1987): Saskatchewan's mineral industry: past and present; CIM Directory, 21st edition, p67-114.

Scott, B.P. (1988): Geology and geochemistry of silver occurrences near Dianne Lake (NTS 74N-10), Saskatchewan; Sask. Energy Mines, Open File Rep. 87-1, 46p (plus three maps).

Petroleum and Natural Gas Division

Bruce Wilson
Executive Director

The Petroleum and Natural Gas Division has major responsibilities in all areas related to provincial jurisdiction over oil and gas resources including disposition and management of Crown oil and gas rights; well licensing and surveillance of all exploration, development and production operations; oil and gas conservation including determination of reserves and producibility estimates; maintenance of production and disposition statistics; crude oil marketing; and royalty and tax legislation.

The responsibilities of the division are carried out through the operation of five branches:

- Geology and Petroleum Lands
- Engineering Services
- Economic and Fiscal Analysis
- Petroleum Development
- Petroleum Statistics

The past year was a period of adjustment and recovery for Saskatchewan's oil and gas industry following the dramatic drop in oil prices in early 1986. Modest increases in oil prices during 1987 coupled with fiscal changes introduced by the federal and provincial governments resulted in improved oil well drilling levels. Of particular note was the increased deep drilling activity in southeast Saskatchewan. Natural gas drilling reached a record level in response to provincial natural gas deregulation initiatives. As part of the natural gas deregulation process, producers have gained greater access to markets. In total, 1,602 oil and gas wells were drilled in the province in 1987 compared with 1,079 drilled in 1986. Interest in the acquisition of Crown oil and gas rights also showed considerable improvement with land bonus payments of $59.9 million received in 1987 compared with $18.2 million in 1986.

Crude oil production rose slightly in 1987 to 12.0 million cubic metres. Production was at capacity for much of the year although minor restrictions occurred due to apportionment on the Interprovincial Pipe Line system. Prorationing was removed from the feeder pipe line systems in late 1987 on a trial basis in order to lessen the possibility of shut-ins. The results of this action have been favourable to date.

As in the past, the majority of Saskatchewan crude moved to markets in Eastern Canada and the United States in 1987. That fact will change with the start-up of the NewGrade heavy oil upgrader in late 1988. The NewGrade upgrader will be able to process approximately 8,000 cubic metres per day of Saskatchewan heavy crude.

Saskatchewan became self-sufficient in natural gas for the first time in 1987. That situation paved the way for enhanced sales of gas to external markets. Total natural gas production in 1987 was 3.0 billion cubic metres with approximately 0.7 billion cubic metres being sold outside of the province. Natural gas production is expected to show significant growth in 1988 due to expanding market opportunities and continued high drilling activity levels.

Petroleum Development Branch

The Petroleum Development Branch is responsible for ensuring that the field operations of the province's oil and gas industry meet acceptable technical and environmental protection standards and that well licensing proceeds in accordance with regulations established under The Oil and Gas Conservation Act.

The Regina staff:

- directs field office operations;
- processes and approves applications for well drilling licenses;
- enters initial data for the Well Information System;
- maintains records and control of well deposits made to guarantee proper drilling, completion and abandonment of wells;
- processes and approves well ownership and name changes;
- advises of offset drilling commitments on Crown land;
- processes weekly drilling reports and compiles statistical data relating to drilling activity;
- represents the department on oil spill co-operatives; and
- processes and approves applications for Geophysical Licences, Crew Certificates and Blasters Permits.

The field office staff:

- collects and compiles drilling, completion and reservoir data;
- enforces regulations, orders and policies pertaining to pollution control in the oil and gas industry;
- checks standards, procedures and equipment used by industry in drilling, producing and abandonment of wells;
- witnesses production tests;
- performs on-site inspections of all wells and facilities;
- investigates and assists in resolving landowner problems associated with the use of land for geophysical activity, exploration and production; and
- investigates, reports and ensures that industry act promptly and efficiently in handling oil and salt water spills.

The Well Information System has continued to be updated and expanded. This computerized system has proven effective in handling well information from time of licencing through to abandonment. In addition to licencing and entering drilling information

into this sytem, staff also registered and recorded 1,795 well ownership changes and 672 well name changes.

The issuance of geophysical licences allowing seismic and logging crews to operate in the province was taken over by this branch in 1987. Staff issued 53 geophysical licences, 106 crew certificates and 107 blasters permits.

Offset commitments were called to 147 undrilled Crown leases as a result of new freehold producing wells. Staff continued to handle large numbers of inquiries pertaining to drainage units, target areas and the requirements necessary in drilling, production and abandonment work. During the year field staff carried out 1,425 pressure maintenance/water disposal well checks, 65 land owner related complaints, 523 production test audits, and reported on all of the activity associated with the drilling, completion and abandonment operations undertaken by the province's oil and gas industry.

Environmental surveillance continued in all of the province's oil producing pools. Nearly 34,000 well, battery and rig inspections were carried out, clean-up was monitored on 545 oil/salt water spills (this number is a reduction from the 582 reported spills in 1986 and represents .02% of the total oil produced) and approximately 350 drilling mud pits were checked to ensure proper pH and chloride levels.

The Saskatchewan Research Council was retained to continue the drilling mud disposal research program. Growth chamber studies and on site inspections were carried out to further evaluate the present disposal guidelines.

Drilling Activity

Drilling activity in 1987 increased compared with the previous 1986 drilling year.

In 1987 there were 1,602 oil, gas and service wells drilled. A breakdown of this activity follows: 811 completed oil wells, 568 completed gas wells, 47 completed service wells and 176 abandoned dry holes resulting in an overall success ratio of 89%. There were 1,671 drilling licenses processed and issued compared to 1,072 for the 1986 calendar year.

Engineering Services Branch

The Engineering Services Branch evaluates Saskatchewan's crude oil and natural gas reservoirs to ensure that exploration, development and production of these resources follow good conservation and engineering standards. Sound management of these resources is essential to achieve efficient production and ensure maximum benefits from development. The mandate for these responsibilities comes from The Oil and Gas Conservation Act, The Crown Minerals Act, The Pipe Lines Act and respective regulations.

Figure 8
Wells Drilled by Area

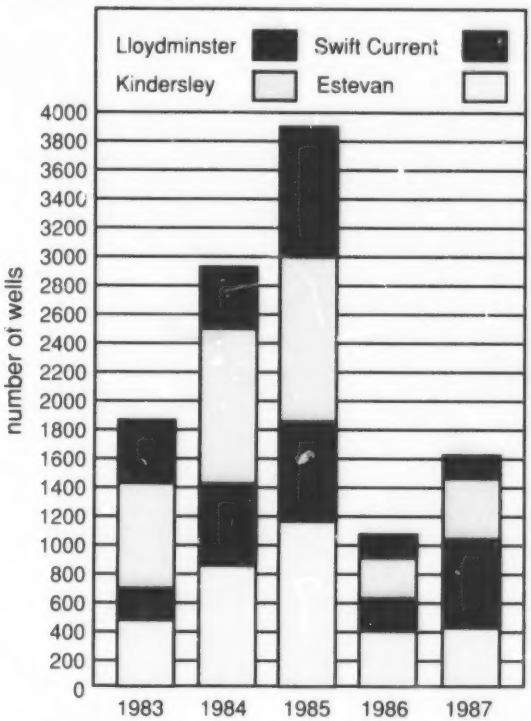
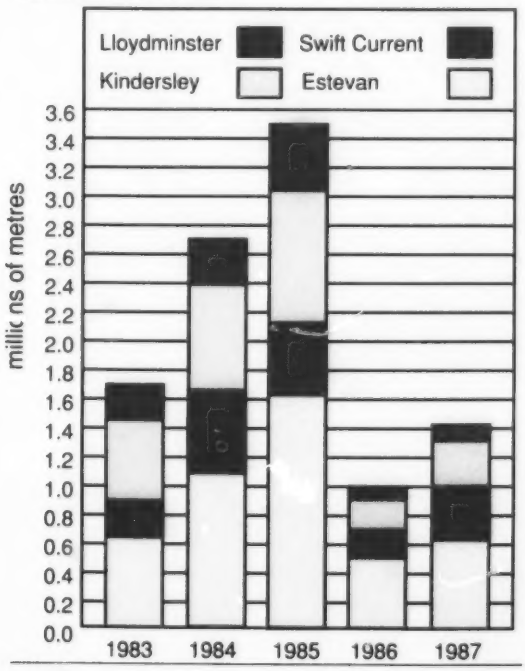


Figure 9
Metres Drilled by Area



Specifically this branch:

- determines crude oil and natural gas reserves for use by industry and government in planning and developing policies;
- evaluates industry applications for enhanced oil recovery projects, waste water disposal wells, off-target wells and other proposals and participates in public inquiries held to consider these applications;
- assesses unitization proposals to ensure that Crown lands receive fair and equitable unit participation;
- evaluates industry submissions for incremental oil production from waterflood and enhanced oil recovery projects to establish reduction to Crown royalties and freehold production taxes;
- establishes pool boundaries, well spacing and target areas to facilitate orderly crude oil and natural gas development;
- issues maximum permissive production rates for oil wells and daily allowables for gas wells, and monitors production to ensure that these rates are not exceeded;
- issues construction and operating permits for oil and natural gas pipelines and witnesses pressure tests conducted to ensure that pipelines meet operating standards;
- prepares for publication, pertinent engineering, development and production data for oil and natural gas pools, including monthly demand for Saskatchewan crude oil;
- monitors crude oil markets and tabulates nominations for crude oil; and
- provides technical expertise and assistance to other branches and divisions in the department.

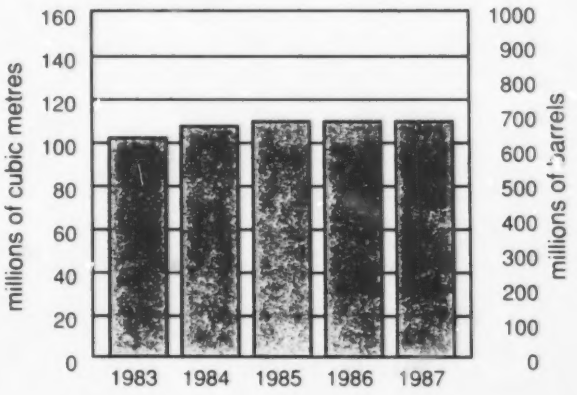
Highlights

- Saskatchewan's first horizontal well was drilled and completed by Sceptre Resources Limited in the Tangleflags area.
- Continued exploration for deep (Winnipegosis formation and deeper) oil in Southeast Saskatchewan resulted in nine new completions in addition to the three completions since the initial Home Tableland discovery in February, 1986.
- The deregulation of natural gas markets and prices in the province prompted immediate gas exploration and development activity resulted in an all time gas drilling record in the province of 568 wells.
- The prorationing of crude oil production was terminated on October 1, 1987, for a trial period of one year after an extensive industry-government task force study.
- Infill programs continued with 20 applications approved in 1987.
- Twenty-three new waterflood projects and expansions were approved in 1987. The first half of 1988 is expected to be very active as the industry attempts to implement such projects prior to June 30, 1988 when the royalty holiday for such projects is reduced.

Crude Oil Reserves

- Saskatchewan's remaining established crude oil reserves were decreased by an estimated 1.3 million cubic metres to 110.429 million cubic metres in 1987. This is the net result of an increase in initial reserves of 10.7 million cubic metres and production of 12.037. These reserve increases are largely attributed to new and expanded waterflood projects and significant Winnipegosis formation discoveries in 1987.
- The department estimates that the potential enhanced oil recovery reserves are 667 million cubic metres with 89% of these reserves classified as heavy oil.
- These potential reserves are an indication of the oil that can be recovered assuming that enhanced oil recovery techniques are successfully applied. Considerable technical risk currently exists requiring further research and experimentation.

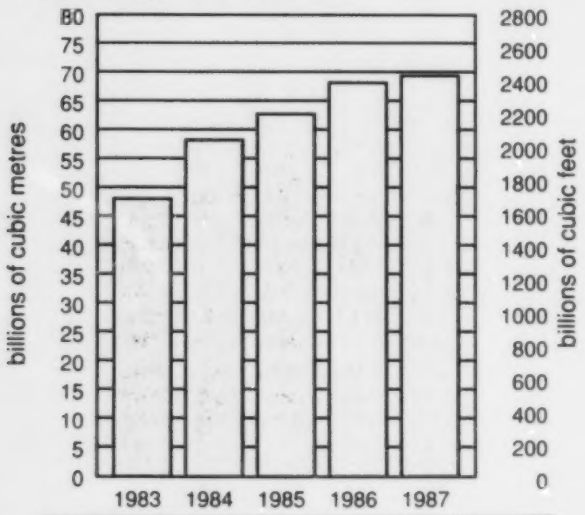
Figure 10
Remaining Oil Reserves



Natural Gas Reserves

- Saskatchewan's remaining established natural gas reserves were increased by an estimated 1.7 billion cubic metres to 69.3 billion cubic metres in 1987. This is the net result of an increase in initial reserves of 4.3 billion cubic metres less production for sales of 2.6 billion cubic metres.
- The department estimates that the remaining ultimate potential which includes established reserves could reach 161 billion cubic metres. Additional exploration and development is required for better evaluation.

Figure 11
Remaining Gas Reserves



Crude Oil Production

- Oil production in 1987 was 12.0 million cubic metres compared to 11.7 million cubic metres in the previous year. This slight increase was the result of continued strong markets for Saskatchewan's crude oil and the drilling activity. On average, there was minimal shut-in of production due to marketing difficulties and pipeline capacity in 1987.
- Saskatchewan's oil production is made up of different qualities of crude commonly identified as light, medium and heavy found in different geological zones and geographical areas. In 1987, approximately 30.7% was heavy oil, 36.2% was medium and 33.1% was light.

Figure 12
Crude Oil Production

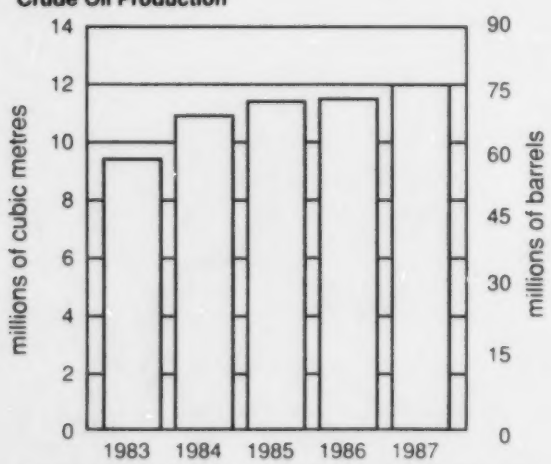
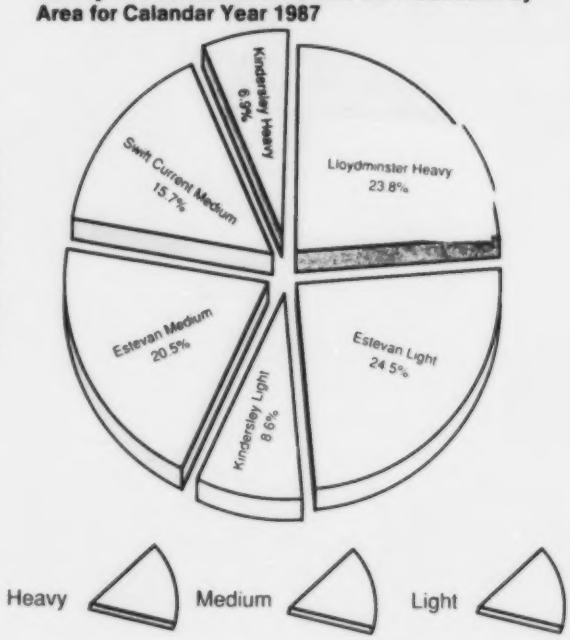


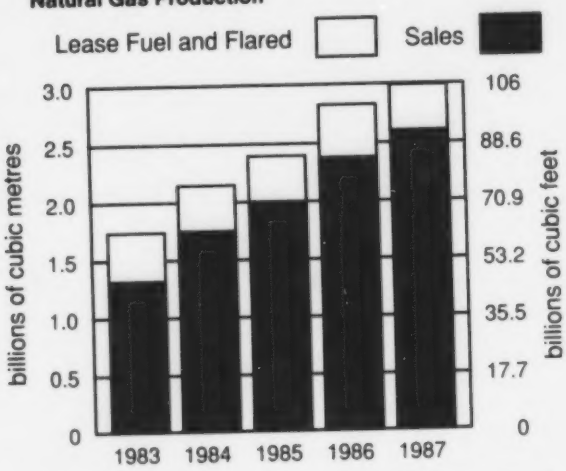
Figure 13
Quality of Saskatchewan Crude Oil Production by Area for Calandar Year 1987



Natural Gas Production

Natural gas production in 1987 was 3.0 billion cubic metres, an increase of 7.1% from the previous year when it was 2.8 billion cubic metres. Sales of the province's natural gas were 2.6 billion cubic metres with the remainder of the production used for lease fuel or flared. Approximately 0.70 billion cubic metres of natural gas were exported from the province in 1987 and 0.08 billion cubic metres were sold in the direct sale market. Natural gas production will progressively increase because of better access to the export market as a result of deregulation. This will allow the province's shut-in reserves to be developed and produced as well as causing further exploration.

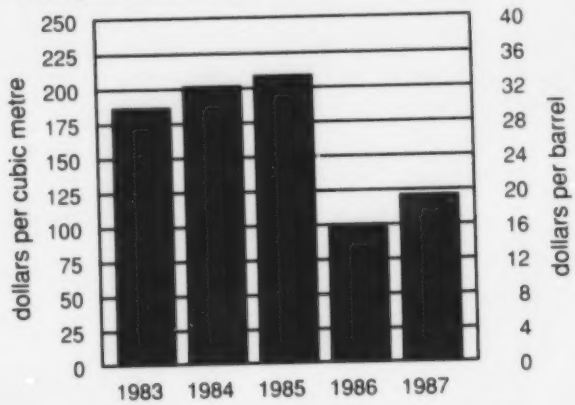
Figure 14
Natural Gas Production



Average Crude Oil Prices

The average 1987 Saskatchewan crude oil price of $124.33 per cubic metre represents a 26% increase over the $99.00 per cubic metre average for 1986. This increase follows the increase in world oil prices over that time period.

Figure 15
Average Crude Oil Prices



Geology and Petroleum Lands Branch

Geology Mapping and Land Evaluation Section

This section has two principal responsibilities: geological mapping and land evaluation.

Geological Mapping Unit

Geological maps (mainly structure contour maps) are drawn and maintained for all oil and gas producing areas in the province. The maps are used for land evaluation, for reserve calculations in the Engineering Services Branch, and in helping solve problems related to the producing areas. At the end of the fiscal year, 123 pool maps were being maintained. The maps may be purchased from the department's Marketing and Publications Branch.

In carrying our their mapping work, geologists acquire a detailed knowledge of the geology of the producing oil and gas pools. This expertise is put to use within the Petroleum and Natural Gas Division when staff members are asked to make recommendations on submissions from industry or in dealing with other administrative matters.

Industry submissions in the reporting period included applications for pressure maintenance of producing units, conversion of wells to salt water injection and disposal, and secondary recovery of oil by waterflood. As well, requests were received for permission to drill wells outside the approved spacing pattern and for abnormal well spacing patterns.

Information and advice were made available to other branches, departments and the general public on requests ranging from the interpretation of the economic geology of known oil and gas accumulations to the hydrocarbon potential of unexplored prospects.

Land Evaluation Unit

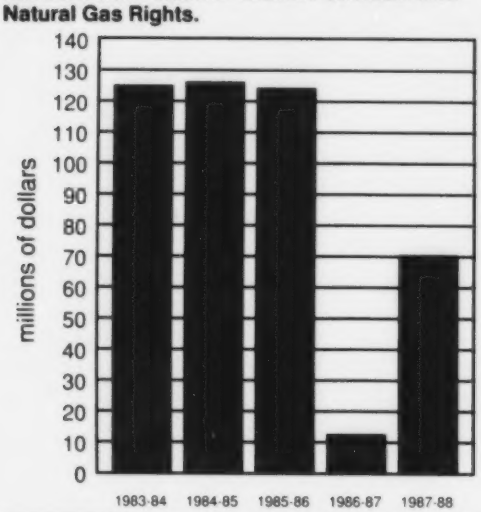
The economic potential of hydrocarbon resources underlying specific areas of the province is determined as required by the department. Monetary evaluations of reserves are primarily for land sales. As well, this unit:

- reviews and recommends requests from industry for the posting of specific Crown mineral lands at department land sales;
- prepares sales notices and technical data for sales;
- reviews and recommends acceptance or rejection of bonus bids received from industry on posted lands;
- evaluates and selects Crown acreage in drilling reservations when such reservations go to lease;

- administers net royalty leases and inspects non-unit net royalty leases and farmouts to ensure compliance with the terms or agreements made within the department;
- reviews requests for waiver of offset well commitments on leases adjoining certain freehold lands producing oil or gas and makes follow-up recommendations;
- advises industry and the general public concerning the value of mineral rights for specific areas.

Four sales of Crown petroleum and natural gas rights were held during the 1987-88 fiscal year. Revenues totalled $70,429,478.97. This compares to $12,344,308.22 received during the previous fiscal year. Dispositions of mineral rights in the 1987-88 fiscal year totalled 454,164 hectares (1,122,264 acres) consisting of 36 permits containing 247,303 hectares (611,099 acres), 19 drilling reservations comprising 30,396 hectares (75,110 acres), and 1,068 lease parcels consisting of 176,465 hectares (436,055 acres). Revenue from the sale of petroleum and natural gas rights for the past five years is shown in Figure 16.

Figure 16
Revenue from Sales of Crown Petroleum and Natural Gas Rights.



Petroleum Lands Section

This section has three principal responsibilities: disposition administration, disposition review and registration.

Disposition Administration

This responsibility involves the administration and disposition of approximately 9.5 million acres of Crown mineral lands under The Petroleum and Natural Gas Regulations, 1969; The Helium and Associated Gases Regulations, 1964; The Oil Shale Regulations; The Mineral Resources Act; and The Oil and Gas Conservation Act.

The number of petroleum and natural gas permits under disposition increased from 109 at April, 1987 to 111 at March 31, 1988 with a proportionate increase in area from 670,729 hectares (1,657,407 acres) to 763,936 hectares (1,887,727 acres). Drilling reservations under disposition increased twofold in the same period from 10 to 20 with an increase in area from 13,959 hectares (34,493 acres) to 31,174 hectares (70,032 acres). Petroleum and natural gas leases in effect also increased from 10,109 at April, 1987 to 10,854 at March, 1988. Area under lease totalled 2,640,801 hectares (6,525,563 acres). Lands under helium leases remained at nine with no change in area at 21,548 hectares (53,247 acres). Helium permits in effect increased from one in April 1987 to eight with a proportionate increase in area from 30,108 hectares (74,400 acres) to 171,417 hectares (423,581 acres) at March 1988. Oil shale permits remained unchanged at four in an area of 161,166 hectares (398,250 acres). A total of 11 gas storage agreements in an area of 39,106 hectares (96,633 acres) were in effect.

Disposition Review

All expiring dispositions are reviewed annually to establish whether they will remain active for another year. A total of 5,358 dispositions were subject to review in March, 1988 which represents an increase of approximately 658 dispositions from the 4,700 reviewed in April, 1987.

Registration

This responsibility involves the monitoring, recording and registering of transactions directly affecting all dispositions through transfers, amalgamations, encumbrances or securities.

A monthly average of 439 transactions occurred in 1988 which represents an increase from the monthly average of 385 in the previous year. The number of transactions affecting dispositions increased from 4,536 at April, 1987 to 5,271 at March, 1988. Searches also increased from 3,080 at April, 1987 to 3,764 at March, 1988. The highest recorded total for searches was 464 in the month of April, 1987. The monthly average of searches increased from 257 in the previous year to 313 ending March, 1988.

Economic and Fiscal Analysis Branch

The Economic and Fiscal Analysis Branch evaluates, designs and implements oil and gas Crown royalty and freehold production tax systems and exploration/development incentive systems to maximize provincial revenues while maintaining an active oil and gas industry. In addition, the branch provides production, revenue, expenditure and employment forecasts related to Saskatchewan's oil and gas fields.

Functionally, the branch is divided into the Royalty/Tax Analysis Section and the Incentive Administration Section.

Royalty/Tax Analysis Section

This section analyses, designs and amends the crude oil and natural gas Crown royalty and freehold production tax regimes cited within The Petroleum and Natural Gas Regulations, 1969 and The Freehold Oil and Gas Production Tax Regulations, 1983. The production, revenue and employment forecasts for internal and external uses are also prepared by this section.

More specifically, this section:

- evaluates the economics of crude oil and natural gas exploration, development and production under varying federal and provincial fiscal arrangements;
- analyses, develops and proposes royalty and tax incentives to encourage implementation of enhanced oil recovery schemes (e.g. waterfloods, steamfloods, carbon dioxide floods);
- monitors and forecasts crude oil prices, gross oil revenues, provincial revenues, oil production and related oil expenditures and employment for internal government use;
- analyses the impact of changes (e.g. world prices, exchange rates) that affect oil and gas activity in the province and surrounding jurisdictions;
- provides analytical assistance pertaining to upgrader negotiations and consumer gasoline inquiries;
- monitors revenue sharing between governments and industry;
- prepares submissions to boards, commissions and other external bodies on future crude oil supplies;
- prepares information circulars, directives and notices to keep industry informed of changes; and
- performs the necessary consultation process with industry regarding policy changes.

Crude oil royalty/tax levels were amended on eight separate occasions during 1987 in accordance with the new price sensitive policy implemented on January 1, 1987.

On the natural gas side, the branch was involved in the development of internal and external gas sale policies due to the deregulation of the natural gas industry and market in the province. These policies became effective October 1, 1987.

Incentive Administration Section

The Incentive Administration Section is responsible for the development, analysis and administration of incentive programs offered by the province to promote increased activity. The section closely monitors the cost effectiveness of these incentive programs to ensure maximum return for the province's incentive dollar and to maintain a positive climate for development and exploration in the province.

This section reviews all requests related to the administration of the oil royalty/tax holiday program. Under the program in 1987, most non-deep wells qualified for a one or three year holiday and deep wells qualified for a three or five year holiday. Similarly, incremental production from new or expanded waterflood projects was eligible for a three year holiday.

In 1987, 811 of the 987 oil wells drilled were completed for production. Of the 811 oil wells completed for production, 128 wells were non-deep development wells eligible for a one year holiday, 621 were non-deep development wells eligible for a three year holiday, 18 were non-deep exploratory wells eligible for a three year holiday, six were deep development wells eligible for a three year holiday and six were deep exploratory wells eligible for a five year holiday. The remaining completed wells did not receive the holiday incentive.

Economic and technical evaluations were carried out under the Workover Incentive Program. Under this program the department may approve the reclassification of old oil production to new oil for royalty/tax purposes. Approval requires submission of a work program designed to maintain and improve production from old oil wells or units. An estimated $4 million was spent by industry under this program in 1987.

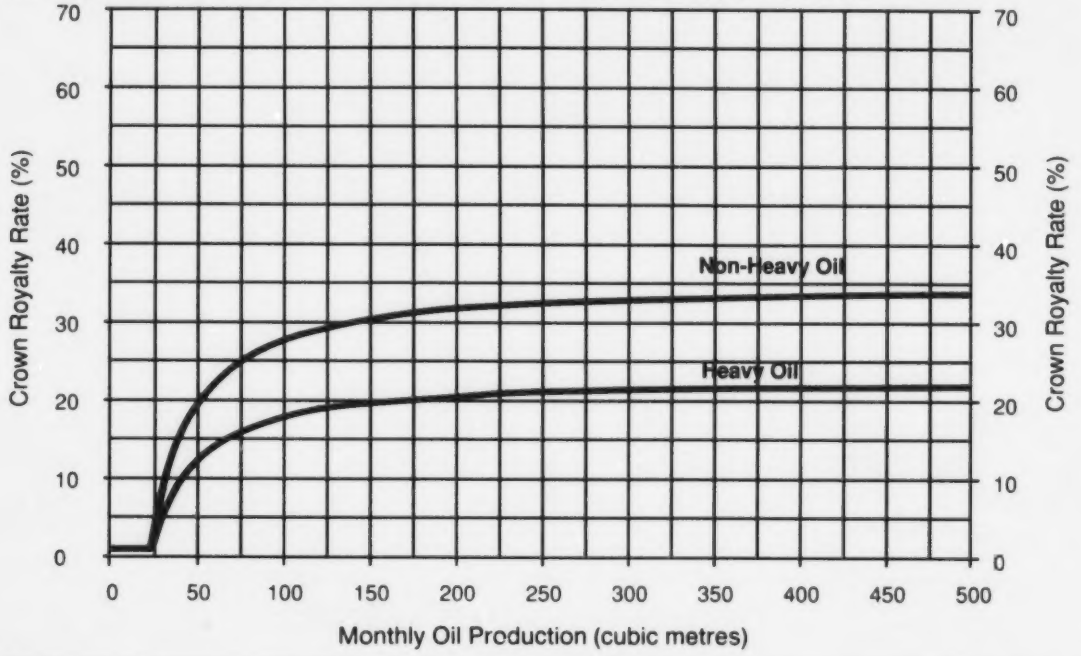
New measures were introduced in 1987 to enable companies and individuals operating in the province to expedite recovery of their outstanding incentive balances under The Oil and Gas Incentive Regulations, 1978. Regulations were amended to allow outstanding incentive balances to be recovered as credits against oil and gas royalties and taxes paid during the period January 1, 1987 to December 31, 1988 and as credits against bonus bid payments made for Crown oil and gas rights after November 5, 1987 and before January 1, 1989.

By March 31, 1988, 134 companies had made application accounting for approximately one-half of the total outstanding incentive balance.

The Incentive Administration Section also performs the following duties:

- monitors and forecasts exploration and development expenditures;
- monitors and forecasts operating costs associated with the production of crude oil;
- determines the initial holiday status of wells as noted on the "Application for Licence to Drill a Well";
- reviews and makes recommendations in regard to holiday extensions due to marketing restrictions or other exceptional circumstances;
- evaluates and analyses the exploration, development and production incentive systems of the federal government and other provinces;
- prepares information letters and policy directives;
- conducts economic and engineering analyses on special issues, wells and/or projects.

Figure 17
Conventional Crude Oil Royalty Curves For New Developments, September, 1987



Petroleum Statistics Branch

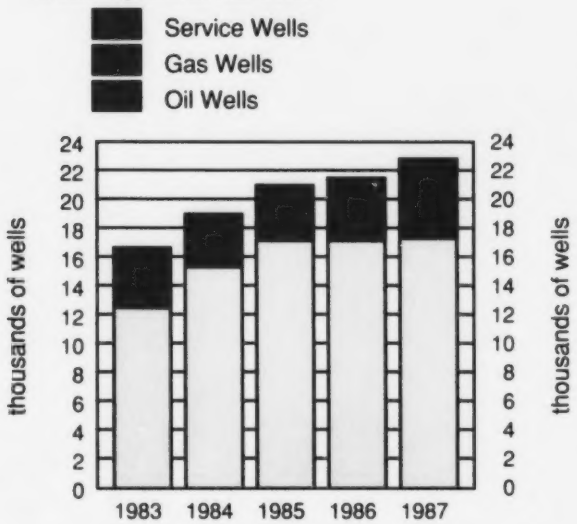
The Petroleum Statistics Branch is responsible for the collection, processing and management of statistical data on the production and disposition of petroleum resources in the province in accordance with the regulatory requirements of The Oil and Gas Conservation Act and regulations thereunder, for the maintenance and efficient operation of computerized data processing and storage systems, for the administration of the Production Monitoring/Testing/Auditing Program, for monitoring and evaluation of wellhead oil and gas prices and transportation costs, and for providing statistical services to both internal and external users.

In particular, the branch:

- collects, validates, processes and records statistical data on the production and disposition of crude oil, natural gas, water and other products associated with oil and gas field operation;
- maintains, develops and implements appropriate modifications and enhancements to existing computer systems as well as designs and develops new systems to meet new policy initiatives;
- participates in a joint review process with other western producing provinces and industry task force committees on the development and standardization of all industry reporting forms, procedures and requirements;
- administers and co-ordinates activities of the Production Monitoring/Testing/Auditing Program to ensure proper and accurate measurement and allocation of production among wells tied to a common producing facility with primary emphasis on wells receiving royalty/tax incentives;
- reviews, establishes and informs industry of the appropriate royalty/tax status and length and commencement date of incentive period of new wells/units as well as maintains and updates the status of existing wells/units;
- monitors, analyses and evaluates posted terminal prices and reported wellhead prices of Saskatchewan crude oil and natural gas and the delivered price of that oil and gas to specific markets;
- monitors and investigates oil and gas production and disposition reporting practices to ensure compliance and to provide assistance and interpretation to industry with regard to regulatory requirements;
- reviews, analyses and evaluates pipeline tariffs and trucking costs and its economic impact on provincial royalty/tax revenues;
- monitors, researches and compiles statistical information pertaining to the marketing of Saskatchewan crude oil and natural gas production;

- monitors, assesses and establishes the quality of Saskatchewan crude oil production on an individual well, battery and pool basis;
- prepares for publication various weekly, monthly and yearly statistical reports on the production and disposition of petroleum and mineral resources;
- provides statistical services to petroleum industry, federal and provincial government bodies, consulting firms, universities and the general public.

Figure 18
Wells Capable of Production



Following the completion of a joint western producing provinces/industry review on standardization of all industry reporting forms, procedures and requirements, work began early in the year to replace the existing automated Production and Disposition System (PDS) that was developed in the late 60's and which has been found to be too complex and costly to accommodate the new reporting formats and requirements. Outside consultant services were acquired on the basis of the merit of their proposals to carry out the project. Work is progressing towards the identification of all functional requirements and the development of a conceptual design for the new PDS. This will be followed with a tender for proposals and selection of a software supplier for system development. The new PDS project is targetted for completion with system development, testing and implementation to be finalized by the latter part of 1989.

With the implementation of Phase 2 of Saskatchewan policy initiatives to deregulate natural gas prices and markets in October 1987, considerable effort was devoted to the development of revised reporting forms and procedures and to the modification of automated systems. Following detailed internal analysis and consultation with the industry, an information package was finalized to assist the industry in understanding both the information and reporting requirements under the deregulated environment. Appropriate modifications and enhancements to the existing automated systems were also implemented not only to facilitate the processing, validation and storage of the information submitted but also to provide the relevant information to ensure all aspects of the deregulation complied with the new policy initiatives.

The branch also continued its role in the administration and co-ordination of the Production Monitoring/Testing/Auditing Program which involves participation from several branches in the department. This program was established to ensure accurate and proper measurement, allocation and reporting of crude oil produced from each and every well in the province. While field staff continued to conduct production testing on a large number of wells with results being monitored and analysed by Regina staff, the major focus was primarily on the development of appropriate system programs to identify wells for monitoring and testing and to enable in-depth analysis of test results to be performed. By fiscal year end, the majority of the system development work had been completed for final testing.